



energy-efficient drives

Answers for industry.





Building costs: -7.5 %



Vehicle fleet costs: -20 %



IT costs: -25 %

Facts that speak for themselves:

- In industrial plants, drives account for just under 70 % of the electrical energy requirement
- By installing frequency converters and high-efficiency motors, 43 TWh of energy could be saved in the European Union alone – this equates to electricity costs of at least 3 billion euros or the energy generated by 19 fossil-fueled power plant units



The most effective way of saving costs: Energy-efficient drive technology

Did you know that electrical drives are responsible for just under 70% of industry's entire power needs?

Rather a lot, don't you think? First the bad news: As energy prices rise, this cost factor will have an increasingly negative impact on your production costs. Now the good news: These 70% hold a considerable saving potential that is just waiting to be released. So why don't you start now – with energy-efficient drive technology from Siemens.

Energy-efficient drive systems can assist companies in a number of ways. They help to reduce production costs, improve the return on investment, and lower CO₂ emissions. On a sustained basis and over the entire life cycle of the plant.

Particularly in energy-intensive sectors, using mechanically controlled pumps, fans and compressors or drives in continuous operation, switching to energy-saving systems has direct benefits. The investment will be recouped in a very short time. Within just a few short months for some applications.

One aspect worth remembering when choosing the right drive technology: Over the entire operating life of your equipment, not the procurement price, but the operating costs make the difference.

So this is what you should look at first, which is where we can help you. As one of the world's leading suppliers of drive systems, we can offer you a particularly extensive portfolio of energy-efficient drive technology – from individual products to expert advice and tools to special services that will help you to discover the full saving potential of your plant. Start thinking about energy efficiency now - you won't regret it.

Where can the greatest savings potential be found?

In drive technology, operating costs are comparatively high in relation to the procurement costs. To illustrate: Operation accounts for 97% of the life cycle costs of a motor, of which the energy costs are usually by far the highest cost factor. Enormous potential for saving is just waiting to be harnessed.

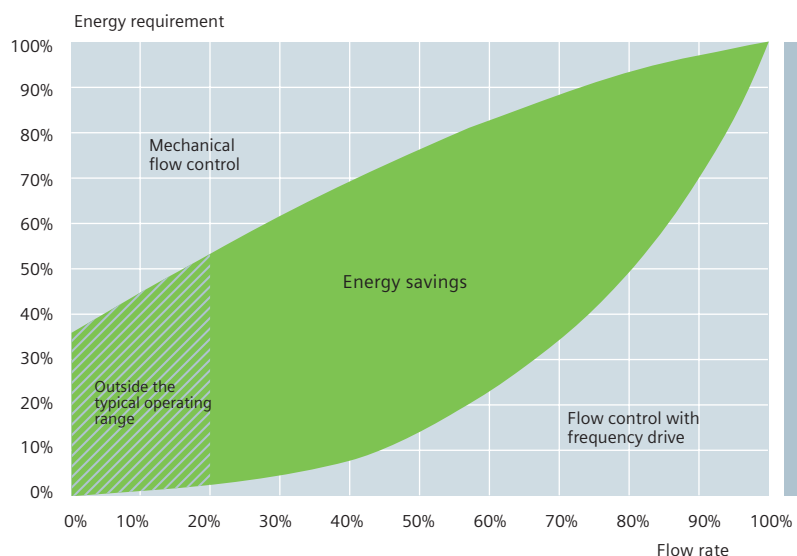
Life cycle versus procurement costs

Despite high life cycle costs, it is usually the procurement price that tips the decision in favor of a particular drive technology. A fact that frequently works against energy-efficient drive technology; after all, the investment costs are higher. But it makes greater business sense to consider the entire life cycle balance of drives. Compare and contrast conventional technology with energy-saving systems and one thing will soon become clear: The high initial outlay for energy-efficient drives is usually recovered within a few months and sometimes operating costs are dramatically cut. Not only with respect to the energy costs but also in other areas like maintenance.

Buy new or upgrade?

There are savings potential to be realized in almost every business. The decision on whether to introduce a completely new concept or upgrade your existing equipment must be made on a case-by-case basis. With new systems, it is relatively easy to calculate how quickly the additional costs for energy-efficient drive technology will be recovered. When considering an upgrade, it is important to look at the application. The more energy-intensive the application or the longer a drive operates at partial load, the faster an energy-efficient system will pay off.

We also have the tools and services to help you find the right energy-saving measures. Whatever you want us to do, whether it be to calculate the payback period of the additional cost for a high-efficiency motor or to perform an energy analysis of your entire plant. We offer you solutions for every type of industrial plant.



Savings ripe for the picking: Pumps, fans, and compressors

The biggest potentials for saving are offered by pumps, fans, and compressors that are still operated with mechanical throttles and valves. Converting to variable-speed drives can produce considerable economic benefits.

Changing the speed rather than mechanically controlling the flow

Mechanical control methods have many hidden disadvantages. For example, the motor runs through-out at the speed rated for the maximum delivery rate, which is rarely needed in practice. Additionally, the throttles and valves lose energy and cause high temperatures and vibrations which can have a negative impact on the drive and production routine.

Variable-speed drives with frequency drives offer a more economic alternative for a number of reasons. They can be controlled much more quickly and precisely. By adapting the flow rate directly to actual requirements, no more energy is lost and savings of up to 60% – in extreme cases even up to 70% – can be achieved, especially in energy-intensive applications.

Reducing costs, improving processes

Compared with mechanical controllers, variable-speed drives reduce not only energy costs, but also maintenance and service costs. They also improve process quality and raise productivity. Current spikes during motor start-up and heavy torque surges are a thing of the past – as are pressure waves in pipe systems, cavitation or vibrations, which cause lasting damage to plants. Smooth starting and coasting down is gentle on the mechanics and prolongs the lifetime of the entire drive train considerably.

In addition to the energy saving achieved by closed-loop speed control, our products also offer additional energy-saving functionality, for example, automatic motor shutdown in certain operating conditions. Frequency converters, such as our MICROMASTER and SINAMICS families, can be added to existing motors at any time. For best results, we recommend an optimization of the entire drive system, considering all of its components.





Up to 50% more efficient: Drives that generate braking energy

Whether you are looking at hoisting applications, centrifuges or conveyor belts – frequency converters with regenerative feedback will cut your energy requirement considerably in all applications using frequent deceleration of large loads.

Driving down high costs

In conventional drive systems, the braking energy generated is lost. Frequency converters with regenerative feedback capability from the SINAMICS family and the SIMATIC ET 200 frequency converter modules feed the braking energy of the motor back into the network instead of burning it up in brake resistors.

In hoisting applications for example, energy savings of up to 50% can be achieved by implementing intelligent infeed technology. Other beneficial side effects can result from efficient infeed technology. For example, components such as line reactors and braking resistors can be dispensed with. The space requirement for the drive system is thereby reduced, as is heat generation.

Will it pay off?

Your energy checklist

You can find out for yourself whether introducing energy-efficient drive systems will pay for itself. Just take a little time to analyze your systems using the following checklist. The more points apply, the higher is your potential for savings:

Look at your primary processes

- Do they still use mechanical flow control?
- Do your motors run uninterrupted for long periods?
- Do you have many drives that run in partial load operation?
- Do you run processes using frequent deceleration of loads?

What secondary processes and building installations do you have?

- Is your factory equipped with air extraction and ventilation?
- Do you operate pumps that run permanently or frequently with a partial load?
- Are you familiar with all your auxiliary processes (conveyor belts, etc.)?
- Is it possible to shut down your auxiliary processes at the weekend?

What about your electricity bill?

- Do you want to reduce the energy costs of your plant?
- Have you ever considered a holistic system analysis of your drives, which looks at everything from the energy management to the pipe lagging?
- Are you paying for reactive power?



Our energy-saving portfolio at a glance:

- A comprehensive range of energy-efficient motors in almost every performance class, with up to 40% reduced power losses than standard motors
- The most comprehensive range of frequency converters available on the market, which, depending on the application, can result in electricity savings of up to 70%
- Regenerative feedback converters with innovative infeed technology, which feed any braking energy generated back into the network, and in the case of hoisting applications, for example, save up to 50% energy
- The SinaSave software tool, which calculates the total saving and payback period of high-efficiency motors or converters
- A comprehensive service package for optimizing the power consumption of drive systems, called EOD, which will help you to identify inefficient electrical drives in your plant and implement the necessary improvements



More efficient all round: Siemens products and services

So what does the energy balance of your plant look like? What did the energy checklist on the previous page tell you? Have you already discovered potential for savings in your systems? Then there's no time to lose. We will assist you with all aspects of optimizing the energy consumption of your drive systems and actively support you in implementing improvements.

As your expert partner, we can offer you an exhaustive package for energy-efficient drive systems – from a single source. From the analysis of your plant to configuration and implementation of new systems to maintenance and service of those systems. Anywhere in the world. Our technical spectrum, which meets all international standards and specifications, is one of the most comprehensive on the market.

Beyond the field of drive technology, we can also offer you Totally Integration Automation and Totally Integrated Power, integrated solutions for your industrial automation and power distribution.

Totally Integrated Automation

This product and system spectrum will give you integrated automation in all sectors, from goods-in to goods-out, from the field to the production level and through to the enterprise resources planning level.

Totally Integrated Automation is a platform on which all drive and automation components intermesh perfectly.

The benefits for you: reduced integration costs and transparency of your automation, in teleservice, commissioning, or operation/process decisions; reduced complexity in industrial plants and tangible cost savings throughout the life cycle.

Totally Integrated Power

With Totally Integrated Power, we can offer integrated solutions for power distribution in functional and industrial buildings – from the medium voltage level to the power socket. Totally Integrated Power embraces not only harmonized products and systems for power distribution, but also efficient motors, motor starters, and frequency converters. Products and services are complemented further by software modules for communication or for integrating the power distribution systems into the building automation and power management systems. Thus our energy concept draws together all components of power distribution to form an integrated whole that will give you not only reliable but above all profitable power distribution.

Unlock the real potential: with SinaSave

Our software tool SinaSave, which you can download free of charge from the Internet, will tell you precisely what potential for savings there are in your application and how fast an investment in an energy-efficient motor or a frequency converter will pay for itself.

You can spend all day philosophizing about possible savings, but our software tool will deliver the facts. Based on the key data of your system, SinaSave calculates potential savings for your specific application. The payback period is then derived from the total monthly savings of your application and the procurement and installation costs of your motor or frequency converter. Often it is just a few months.

How SinaSave works

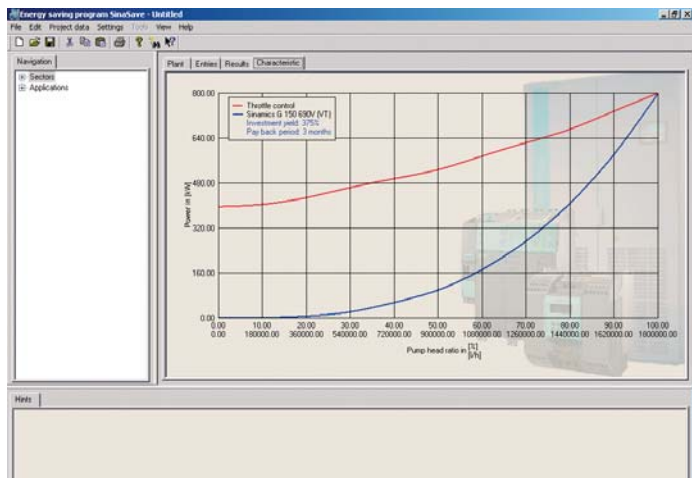
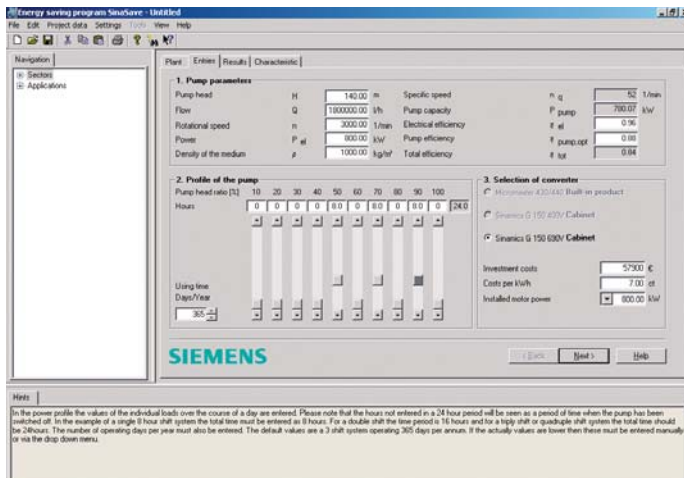
SinaSave has been designed to select an energy-efficient motor in on-line operation or a frequency converter for variable-speed and therefore energy-saving operation.

In on-line operation, you can calculate the cost savings and payback period of our energy-saving motors class EFF1 or NEMA Premium based on three comparison cases: compared with motors EFF2 or

EPAct, individually selected and known motors, or compared with known motors within a complete system analysis.

In converter operation, SinaSave looks at all the necessary system-specific parameters as well as values required for the process: for example, the flow rate of pumps, the density of the medium and the efficiency of the pumps, fans, and compressors of the entire system. Other basic data the program draws on are the number of working days and shifts as well as the delivery profile determining the energy-saving effect over the day and the year. Based on plant-specific data, the program derives a suitable drive system, calculates the price of a suitable frequency converter and derives the energy requirement of the variable-speed drive system as compared with all potential alternative concepts.

For further information about our services, please go to:
www.siemens.com/energy-saving



A powerful energy-saving module within our energy optimization service (EOS).

In addition to determining the saving potential of individual applications, we also help you optimize the energy consumption of the entire plant with our energy optimization service (EOS). The EOD service package included in EOS focuses on drive systems in which the energy optimization will pay back the investment in no longer than two years. This offers targeted cuts in energy costs without a high initial outlay.

To achieve maximum cost-benefit effectiveness, EOD uses a three-step optimization concept:

Step 1: Estimate of potential

Based on motor lists and operating times, we estimate the theoretical energy-saving potential and prepare a specific quotation for an energy analysis of your entire drive systems performed on your site.

Step 2: Energy management analysis

In this in-situ analysis, we identify electric drives that are inefficient in technical and economic terms and determine the precise energy cost saving. We then work out a specific optimization concept by means of cost-benefit analyses, taking your technical requirements into account.

Step 3: Technical implementation

In the last step, we take care of the technical and organizational implementation of the optimization measures based on result-dependent contracts.

Comprehensive energy optimization

EOD is an important module in our comprehensive energy optimization service (EOS). As part of EOS, we examine not only drives but also all relevant energy processes and forms of energy in the plant for potential savings. With EOS, companies can usually cut energy costs by at least 10%.

You can obtain information about our services in the Internet at: www.siemens.com/simain



A whole range for energy efficiency: a run-down of our products



Energy-saving motors

We offer you high-efficiency motors for various applications and all international markets with up to 40 % reduced power losses compared to standard motors. We offer a broad spectrum: for voltages from 230 V to 13.2 kV, for power from 0.06 kW to 100 MW and the corresponding international versions with efficiency classes EFF1 and EFF2 according to EU/CEMEP and for the North American market complying with EPart and NEMA Premium. Our motors are available up to 690 V both for on-line and inverter operation and are a perfect match for our SINAMICS converters and SIRIUS motor starters.

Geared motors

In the power range from 0.09 to 200 kW, we cover all drive applications in every sector with commonly used types of gearing. For a positive energy balance, we can also supply EFF1 motors according to EU/CEMEP from our complete range of MOTOX geared motors. The geared motors MOTOX up to 15 kW (4-pole) achieve efficiency class EFF2. Moreover, the 4-pole geared motors comply with efficiency class EFF1 as standard. MOTOX geared motors are primarily characterized by their very high nominal transmission torques and flexible combinability. Efficiency is a key feature of all. The efficiencies of spur, offset, and bevel gearing are usually 98 % (1-stage), 96 % (2-stage), and 94 % (3-stage).

Frequency converters

For future-proof drive concepts, we offer you frequency converters for every requirement – with simple and common tools for commissioning. For example, the most extensive range of frequency converters on the market includes the general-purpose MICROMASTER 420, MICROMASTER 440 with sensorless vector control for more demanding requirements and MICROMASTER 430 with energy-saving mode. For complex plants, we offer the SIMATIC ET 200S FC and ET 200pro FC converters which are directly integrated into the distributed I/O SIMATIC ET 200 as modules.

Our SINAMICS drive family also provides a suitable frequency converter for every task. In the low-voltage range, these include SINAMICS G110 for low powers and SINAMICS G120 for a multitude of applications up to the mid power range with many innovative functions like energy recovery and safety integrated.

SINAMICS G130 modular built-in units and SINAMICS G150 cabinet-mounted units, on the other hand, are specially tailored to single drives with high power that do not require regenerative feedback, such as pumps, fans, or compressors up to 1,500 kW. In the medium-voltage range, we offer SINAMICS GM150, SINAMICS GL150 and ROBICON Perfect Harmony for powers up to 120 MW. ROBICON Perfect Harmony is a transformer, power section, and closed-loop control in one and provides very high availability due to its innovative concept.



Motor starters

Our communications-capable SIRIUS motor starters are the right choice for switching, protecting, or monitoring motors.

Direct-on-line, reversing, and soft starters cover the complete range – from the high number of switching operations to soft starting and ramp-down for pump applications or fans without mechanical or electric spikes.

From simple SIRIUS combination starters to prewired fuseless load feeders to motor starters for distributed I/Os SIMATIC ET 200S and ET 200pro, all our motor starters and soft starters are particularly space-saving, quick to install, and easily connected to the automation level via AS-Interface, PROFIBUS or PROFINET. Installed centrally in the cabinet or directly in the field – our motor starters can optionally incorporate intelligent monitoring functions, including preventive maintenance and safety-integrated functionality. Data such as maintenance data enables you to cut outage times, service data minimizes non-productive times, and operating data gives you efficient power management. For continuous operation without changes in speed, our motor starters are a simple, practical, and energy-saving solution.



Power management

Power management systems help you improve the transparency of the energy requirement and energy quality and ensure the availability of energy distribution. With our SENTRON PAC3200 innovative power monitoring device, which can be connected to all kinds of loads, you can continuously measure the electrical power values. The measurement results can be evaluated with the power management add-ons such as SIMATIC WinCC powerrate and SIMATIC PCS 7 powerrate.

This can save up to 20% of operating costs. For further energy optimization, our software solutions for power management offer you extensive functions such as online display of measured values and status of energy distribution, event logs of the current fault status in the plant, options for graphical comparison of the measured quantities, or standardized evaluation and export of archived energy data as required for cost center management.

Tried and tested: Energy efficiency successfully implemented



MICROMASTER frequency converter ensures cost-efficient diesel transportation at Shell



Frequency converters permit 66 % energy savings in a flue-gas filter system at Siemens

More efficient pump systems at Shell

Shell Deutschland Oil GmbH has a large tank depot at Kaiserwörthhafen for transshipment and storage of gasoline and diesel engine fuels and light oil. The products are supplied via pipelines and barges, stored, and shipped onward in tank cars. The main pumps for this diesel transportation were to be operated at the optimum operating point. The aim was to save the excess energy previously lost via mechanical shut-off and control valves.

The solution: SinaSave revealed that the use of frequency converters pays off within a short period of time. Frequency converters MICROMASTER 440 with a power of 132 kW were installed as well as 1LG4 motors for the redundant pump system. The payback period is approx. 14 months. The monthly savings in energy costs are 3,000 euros.

Beneficial side effect of the new technology: The processes were improved and the piping networks were relieved of surges caused by on-line operation of the main pump. This resulted in additional savings for maintenance and gave a lasting boost to plant availability.

Energy-saving ventilation at the Siemens motor plant

At the Siemens production plant in Bad Neustadt, a ventilation system with throttle control and a 20-year-old motor had been in use in the flue-gas filter system of the aluminum-smelting furnaces. First of all, the previously used electric motor with a nominal power of 45 kW was replaced with an energy-saving motor. This alone resulted in an energy saving of over two percent, i. e. 535 euros per year.

The motor was also equipped with a MICROMASTER 430 frequency converter, which now not only controlled the motor speed but also the air-flow rate. Previously, the air flow had been controlled via a mechanical throttle valve. Both previous system components – the motor, which ran at high power at a constant speed, and the throttle valve with its resistance and energy loss – consumed a disproportionate amount of energy. The result was therefore doubly beneficial: Replacement of the mechanical control with the MICROMASTER 430 yielded an energy saving of 66%.

The holistic measure including replacement of the entire drive system, which runs 24 hours a day, reduced the power costs from previously 24,000 euros to about 7,000 euros per year.



Variable-speed drives ensure profitable water supply in Madrid



Energy optimization realizes a high saving potential at the ALRO Group

Reliable and profitable water supply in Madrid

About 1,000,000 people live in the southern district of Madrid and they want to be supplied with water throughout the summer dry season. To achieve precise but flexible management of the water reserves, the Picadas I und II and Plaza Castilla central drinking water pump stations were equipped with variable-speed drive systems.

Via the motor speed, the delivery rate of the pumps can now be optimally adapted to the fluctuating water demand. Variable-speed operation reduces mechanical wear throughout the pump station and makes a double-figure percentage saving in energy compared to mechanical control concepts. Because of the large delivery rates – the pumps of the Picadas stations often have to handle 3.5 m³/s – drive powers in the megawatt range are necessary. For this purpose, medium-voltage converters are used, in this case SINAMICS GM150.

The existing motors, which were still in good condition, were retained and – by using the frequency converter – upgraded to a variable speed drive system. Motors with excessively poor efficiencies had been replaced. This replacement boosted the efficiency from 92 % to 97 %. The total payback period for the complete investment was only 2 years.

Energy optimization at the ALRO Group

The surface treatment of plastic components and metal products by powder coating and wet painting is ALRO's core activity. At its factory in Limburg, Belgium, the saving potential for reduction of the power requirement of pumps and ventilators for a painting system for automobile components was to be examined.

The first step was a stochastic analysis of the potential of all installed pumps and fans with a power of 5 KW or more. In the case of 12 drives, a saving potential with a payback period of less than 1,5 years was ascertained. The pumps and the fans were previously controlled using throttles and valves. This loss-prone technology was to be replaced by MICROMASTER 430 frequency converters.

The analysis revealed a saving potential of 19,870 euros per year in the 12 drives. The payback period is less than 1.5 years. So, it was an easy decision for the management to implement the project.

Links – your click to added value

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